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LSI Interface
For Seadata Reader

A Seadata Model 12A cassette reader has been interfaced to an
LSI 11/2 microcomputer in order to allow a quick-turnaround look at
data. Many instruments in the Pacific Marine Environmental Laboratory
use Seadata cassette recorders for data storage. Before deployment, the
instruments must be tested and the data recorded on their test
tapes must be inspected to insure the proper operation of the instrument.
This phase of the pre-deployment test procedure has been sped up
dramatically by using the LSI 11/2 to read, format, and print the test
data. It should be emphasized that this system is intended primarily
for use with test tapes where the total volume of data is less than
0.5 megabits.

Hardware Interface

The hardware interface between the LSI-11 and the 12A consists of a
custom-built latch board, which resides inside the 12A reader, and a
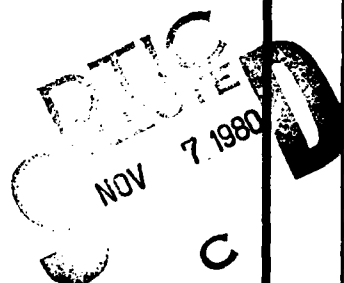DRV11 parallel interface board, which plugs into the LSI-11 backplane.
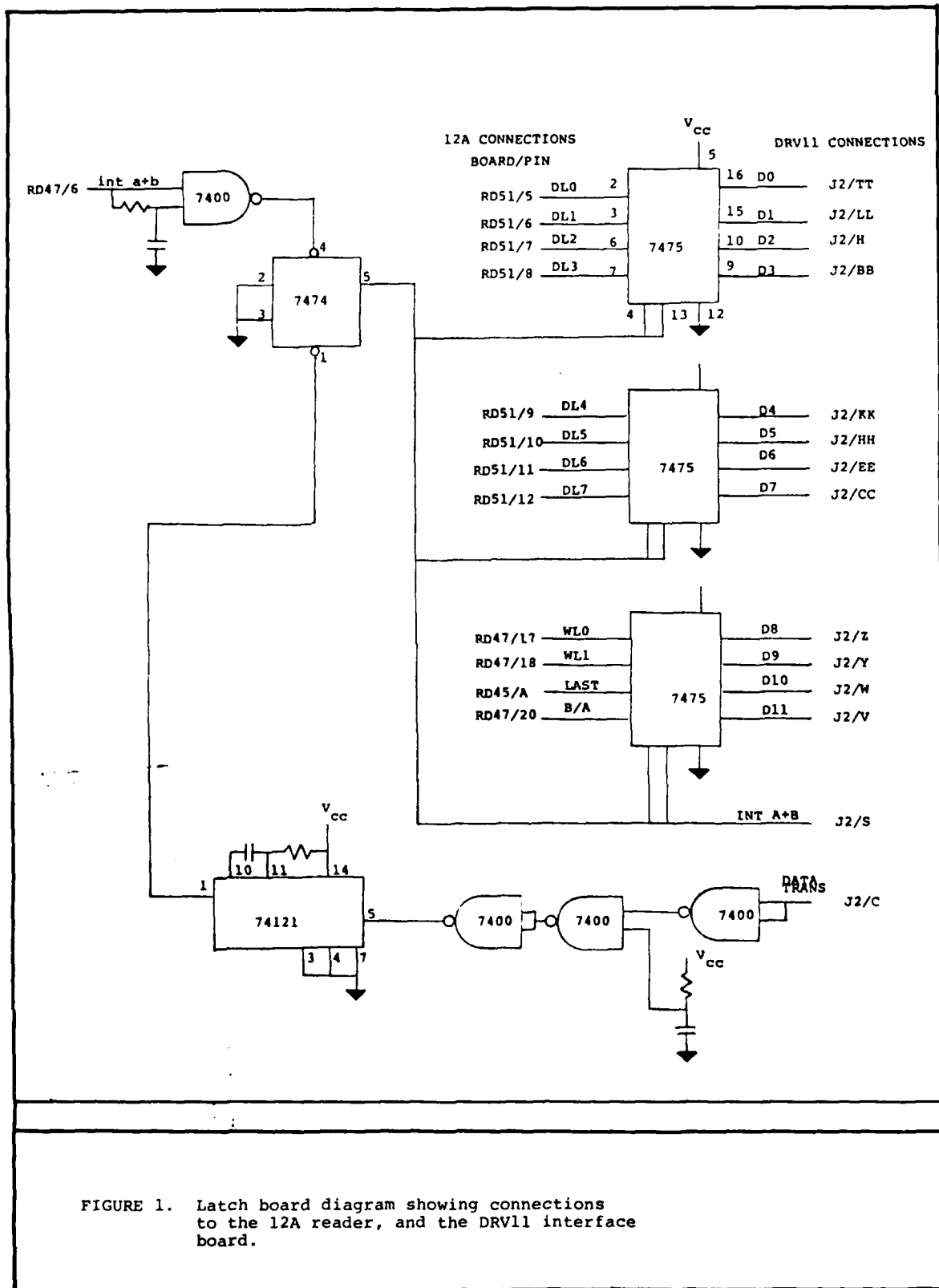
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FIGURE 1. Latch board diagram showing connections
to the 12A reader, and the DRV11 interface
board.

The latch board latches the current data and the interrupt signal from the reader. This data is then held until the LSI-11 returns a "data accepted" handshake signal. A diagram of this latch board is shown in Figure 1. The board was mounted inside the reader, and a separate backpanel connector was installed for the latched outputs. In this way, none of the existing features of the reader were interfered with.

Software

The software interface for this system consists of a main program written in FORTRAN, and some FORTRAN-callable subroutines written in MACRO, the LSI-11 machine language.

The MACRO subroutines are responsible for handling the Seadata interrupts, and some data manipulation tasks.

From a users standpoint, the program asks for the number of data words in a frame and the number of bits in each word. Once this information is supplied, the user is instructed to start the reader. A typical data format entry is shown in Figure 2. While the reader is running, the LSI-11 is buffering the data into memory. After all the data has been read, the operator types an "E" signifying the end of data. The LSI then types the data on the printer according to the format received from the user. The data shown in Figure 3 is formatted as shown in Figure 2.

```
PLEASE ENTER THE NUMBER OF DATA WORDS PER FRAME:7

IS 7 THE CORRECT NO. OF WORDS PER FRAME?
Y

ENTER THE NUMBER OF BITS PER DATA WORD
(IN ORDER)  FOR A DATA FRAME.
24
24
24
8
8
16
24


IS THE FOLLOWING THE CORRECT DATA FORMAT:
   24
   24
   24
    8
    8
   16
   24
Y


START THE READER NOW.
```

FIGURE 2. Typical data format entry.

In addition, the software generates a frame count (the first column in Figure 3), and displays the Seadata error word which is generated by the 12A reader (the last column in Figure 3). The data can be formatted to have any integral number of Seadata characters per word. Figure 4 shows the same data as shown in Figure 3, configured as eight words with 20, 4 12, 1., 32, 8, 20, 20 bits per word. Currently, the data is printed in HEX; however, options are planned to allow octal or decimal printouts also.

```
42  0101?D  0101FF  010101  3F  7F  0101  010101  0F
43  0101?D  0101FF  010101  3F  7F  0101  010101  0F
44  0101?D  0101FF  010101  3F  7F  0101  010101  0F
45  0101?D  0101FF  010101  3F  7F  0101  010101  0F
46  0101?D  0101FF  010101  3F  7F  0101  010101  0F
47  0101?D  0101FF  010101  3F  7F  0101  010101  0F
40  0101?D  0101FF  010101  3F  7F  0101  010101  0F
49  010101  010101  010101  07  01  010F  657B01  0F
50  010101  010101  010101  65  7B  0101  010101  0F
51  010101  010101  010101  65  7B  0101  010101  0F
52  010102  010105  010107  65  7B  0101  010101  0F
53  010105  010105  010105  65  7B  0101  010101  0F
```

FIGURE 3.   Print-out of data as formatted in figure 2.

```
43  01017  D  010  1FF  0101013F  7F  01010  10101  0F
44  01017  D  010  1FF  0101013F  7F  01010  10101  0F
45  01017  D  010  1FF  0101013F  7F  01010  10101  0F
46  01017  D  010  1FF  0101013F  7F  01010  10101  0F
47  01017  D  010  1FF  0101013F  7F  01010  10101  0F
48  01010  1  010  101  01010107  01  01086  57B01  0F
49  01010  1  010  101  01010165  7B  01010  10101  0F
50  01010  1  010  101  01010165  7B  01010  10101  0F
51  01010  7  010  105  01010765  7B  01010  10101  0F
52  01010  5  010  105  01010565  7B  01010  10101  0F
53  01010  3  010  103  01010365  7B  01010  10101  0F
54  01010  1  010  101  01010165  7B  01010  10101  0F
```

FIGURE 4.   Same data as in figure 3, but with different data format.

FOR FURTHER INFORMATION, CONTACT:

NOAA/PMEL
Building 32
7600 Sandpoint Way, N.E.
Seattle, WA   98115
Attn: Pat McLain

Pat McLain is an electronics engineer at NOAA's Pacific Marine Environmental Laboratory in Seattle. He received his BS degree in Engineering Physics from the University of Kansas and an MSEE from the University of Washington.

Offshore beach profiles in open ocean environments are notoriously difficult to obtain. Changes in the offshore beach contour frequently occur after extreme storm conditions, and in the aftermath of these conditions it may not be possible to operate the shallow-drafted small craft[1,2] needed to obtain offshore beach data. Most open ocean beaches have a permanent swell present and hand lining or using an acho sounder in these conditions is hazardous and likely to produce inaccurate results. A helicopter was available during a recent exercise to monitor sand movement over an offshore pipeline, and it was decided to use it in conjunction with lowered instrumentation to obtain offshore beach profiles.

A Means Of Obtaining Offshore Beach Profiles By Helicopter

For initial uncorrected field measurements, the instrumentation package consists of a lowered absolute pressure transducer with a voltage regulator, and conducting cable to a display unit in the helicopter (Figure 1). Compensation of the pressure transducer for barometric
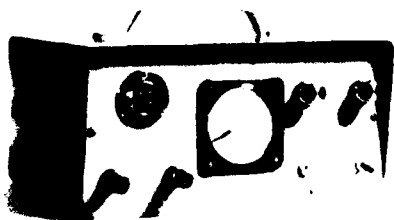

Figure 1. Electroplumb Instrumentation. (Subsequently holes were drilled in the sensor casing to assist free flooding.)

pressure and wave-induced pressure variations has been incorporated into the unit with manual zeroing and electronic filter circuits. The depth in meters is displayed on the front panel with an analog meter. Output terminals, also on the front panel, provide the option of using a 3 1/2-digit digital meter for increased depth measurement resolution. Copies of the instrumentation specifications and schematics can be obtained from the author.

Another pressure-related variable in beach profile measurements is due to the tide level. Tide information is commonly available from separate tide recording systems and it may also be obtained by interpolation from tide tables. Appropriate time related tide heights for the area being profiled are necessary for subsequent data reduction to compute beach profiles relative to coastal datum.

The transducer is connected to the display unit with a 50-m length of 4-conductor p.v.c. cable. This cable is strong enough for deploying the weight of the ballasted transducer package. On the cable is a buoy (of the type used in Aanderaa current meter installations) which is free to move up and down the cable. The door of the helicopter is removed to allow the cable to be deployed and recovered.

The helicopter crew consists of a pilot, surveyor, and winchman. Installed on the helicopter is the master unit of a Decca Trisponder system which functions with two slave stations on accurately surveyed onshore sites. The master Decca Trisponder unit has two digital displays which indicate the distance to the nearest meter and to the left and right slave stations.

Prior to the exercise the surveyor prepares a list of stations to monitor which coordinates the

helicopter positions relative to the surveyed slave stations. Each member of the crew is connected to a portable intercom system featuring noise-cancelling boom microphones and a separate control box giving individual control of levels, push-to-talk switches, etc. This unit was designed and built by the department expressly for this exercise.

After take-off, the surveyor, noting the Decca Trisponder readout, talks the pilot onto the station position. Then, when on site, the winchman is given instructions to lower the transducers and, as the transducer is lowered to the bottom, the buoy floats up the cable and remains on the surface with the weighted transducer securely on the bottom. The pilot, having received word that the transducer is on the bottom, lays back the helicopter. Then the winchman pays out the cable as necessary until the pilot is able to sight the buoy through the lower front window of the helicopter. He positions the helicopter into the wind for minimum disturbance and, using the buoy as a position reference, maintains the helicopter on station. Meanwhile the winchman notes the display reading and the transducer is then recovered as the buoy slides down the cable until it meets the transducer's bridle mount. The operation is then repeated at the next station.

The crew engaged in this exercise has carried out many surveys and has perfected the technique to the extent that 40 stations have been monitored in a 3-hour flying exercise. Figure 2 illustrates some typical offshore profiles using the helicopter and "Electroplumb" instrumentation.

It is apparent that the system can be extended to replace standard lead lines on survey craft since a catenary in the cable does not affect the
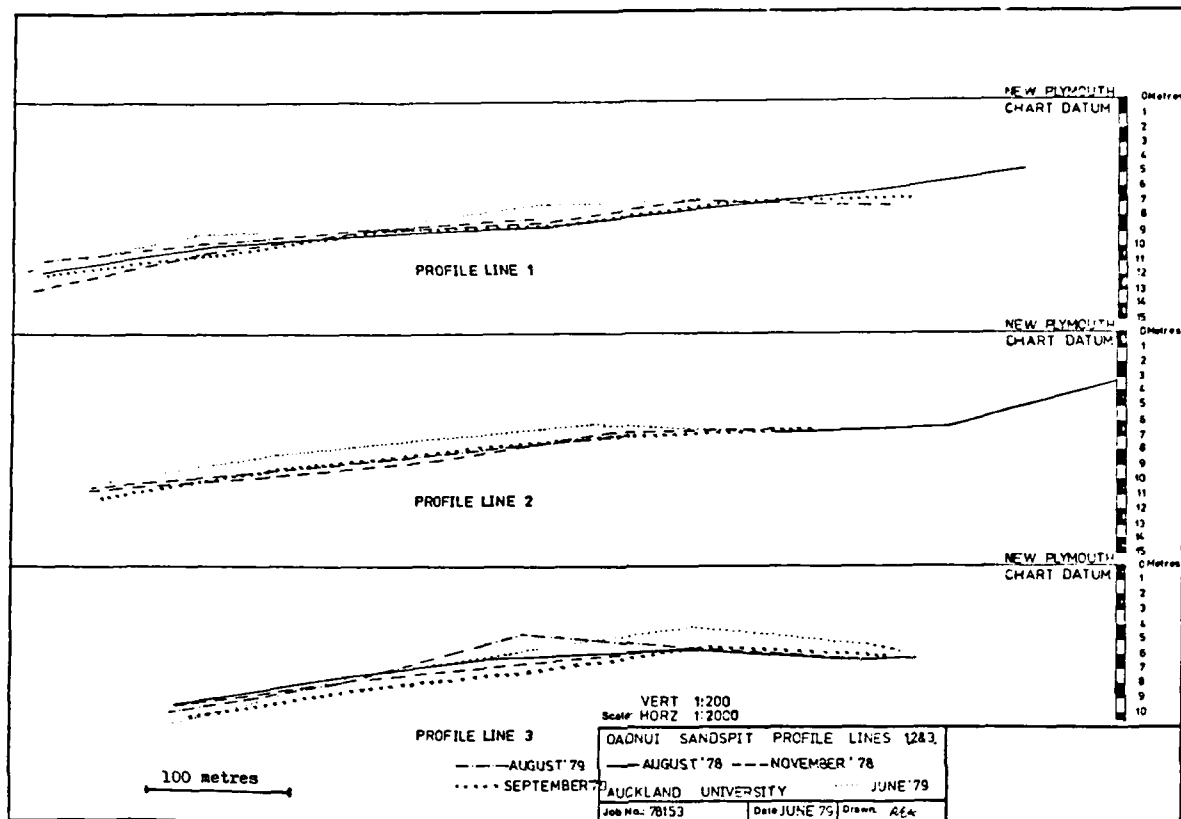
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Figure 2.   Some Examples of Offshore Profiles Obtained with Helicopter Sounding by Electroplumb.

transducer measurement. Calibration is done in still water from the dock side prior to each exercise. The success of the system has prompted consideration for the use of a Paros Scientific pressure transducer and the use of digital integration to obtain even better accuracy. The present system gives field resolution in the order of a few centimeters and one would expect the Paros Scientific sensor to better this by an order of magnitude.

References

[1] Zwaborn, J. A., Russell, K. S. and Nicholson, J. 1972. Coastal Engineering Measurements. *Proceeding Coastal Engineering.* Vol. 1.

[2] Bascom, Willard. 1964. *Waves and Beaches.* pp 172-183. Anchor Books, Doubleday & Co. Inc.

FOR FURTHER INFORMATION, CONTACT:

D. A. Jones
Department of Physics
The University of Auckland
Private Bag
Auckland, New Zealand

Telephone: 792-300

East Africa to take a appointment as Signals Officer, Tanganyika Police. Following the Independence of Tanganyika, he transferred to the Diplomatic Wireless Service of the Foreign Office, holding positions

D. A. Jones received his education at Birmingham College of Technology in the U. K.   He was first employed in the Home Office Communications Directorate before being seconded to *in Somalia and the Middle East before taking up his present appointment as Senior Technical Officer.   His major interests are in teaching and research projects associated with Geophysics.*

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